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BINGHAM MCCUTCHEON LLP THREE EMBARCADERO CENTER SAN FRANCISCO, CA 94111-4067			GUILL, RUSSELL L	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	Application No.	Applicant(s)
	09/847,642	LAVAGNO ET AL.
	Examiner Russ Guill	Art Unit 2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 01 October 2007.  
 2a) This action is FINAL.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1,2,4-22,33,34 and 36-60 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1,2,4-22,33,34 and 36-60 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on 27 July 2001 is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

1. This Office Action is in response to an amendment filed October 1, 2007. No claims were added or canceled. Claims 1 - 2, 4 - 22, 33 - 34 and 36 - 60 are pending. Claims 1 - 2, 4 - 22, 33 - 34 and 36 - 60 have been examined. Claims 1 - 2, 4 - 22, 33 - 34 and 36 - 60 are rejected.
2. In a previous Office Action dated April 11, 2006, the Examiner noted that the application will be forwarded to the Office of Initial Patent Examination for issuance of a corrected filing receipt, and correction of Office records to reflect the inventorship as corrected. This action is being retracted because it appears that the provisions of rule 1.48 (b) were not completely satisfied, since a processing fee does not appear to have been paid (rule 1.48 (b)(2)). However, in order to expedite the examination process, the Examiner is proceeding with examination as if the inventorship will be corrected.
3. **The Examiner would like to thank the Applicant for the well-presented amendment, which was useful in the examination process. The Examiner appreciates the effort to carefully analyze the Office Action and make appropriate arguments and amendments.**

### *Response to Remarks*

4. Regarding claims 33 - 34, 36 - 40 and 41 - 54 rejected under 35 USC § 101:
  - 4.1. Applicant's arguments have been fully considered, but are not persuasive. Applicant's argument appears to be merely an allegation of fact.

5. Regarding claim 1 rejected under 35 USC § 103:

5.1. Applicant's arguments have been fully considered, but are not persuasive, as follows. Accordingly, the rejection is maintained.

5.2. The Applicant argues:

5.3. Claim 1 recites at least the following limitations which claims x and y also similarly recite:

5.3.1. generating an optimized assembler code for the software program;

5.3.2. generating an assembler-level C software simulation model by translating the assembler code or disassembling a binary code, in. which the simulation model is annotated with information related to estimation or determination of the performance comprising execution delay based upon architecture of hardware on which the software program runs; (emphasis added.)

5.4. Applicants first respectfully submit that Passerone does not disclose at least the above claimed limitations as purported in the Office Action.

5.5. Claim 1 explicitly recites the claimed limitations of "generating an optimized assembler code for the software program" and "translating the assembler code into an assembler-level C software simulation model . ." In contrast, Passerone starts with a "high level formal language" which describes the functionality of each block and how they are connected together; Passerone then translates this "high level formal language" description of the system into an intermediate level. **Sec. 2.1, ¶1.** That is, Passerone starts with a high level formal language model and then generates an intermediate level model. This is not, however, the claimed limitations which "generat[e]

an optimized assembler code for the software program" and "generat[e] an assembler-level C software simulation model by translating the assembler or disassembling a binary code" as Passerone merely generates a high-level formal language model first and then translates it into an intermediate level, and a high-level formal language model is not an assembler code. As such, Passerone does not disclose at least this claimed limitations.

5.5.1.1. The Examiner respectfully replies:

5.5.1.2. First, claim 1 does not appear to explicitly recite, "translating the assembler code into an assembler-level C software simulation model . . .", as recited above.

5.5.1.3. Second, Passerone is not relied upon to teach "generat[e] an assembler-level C software simulation model by translating the assembler or disassembling a binary code", so the arguments directed to the limitation do not appear to be valid.

5.5.1.4. Third, regarding the limitation, "generat[e] an optimized assembler code for the software program", Passerone appears to recite, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above" (*page 3, section 2.2, first paragraph*). The ordinary artisan would have known that in order to execute the synthesized C code, that the code would be compiled to generate assembler code, and that a compiler generates optimized code. In order to support the knowledge of the ordinary artisan, please note that Hellestrand shows compiling to generate assembly code (*figure 3A, elements 309, 311*).

5.5.1.5. The arguments appear to be against the references individually, and one cannot show non-obviousness by arguing the references individually where the rejections are based on combinations of references.

5.6. The Applicant argues:

5.7. Applicants further respectfully submit that Passerone also fails to disclose the claimed limitation of "generating the assembler code into an assembler-level C software simulation model by **translating the assembler code or disassembling a binary code**" of claim 1. Firstly, Passerone is absolutely silent on disassembling any binary codes. Secondly, Passerone only discloses some translation twice in its entirety. Passerone uses POLIS to translate a formal specification of the system into a "network of CFSMs," **Section 2.2**, and into an "intermediate format" for optimization in speed and size, **Section 2.1**. However, Passerone is also silent on translating an assembler code into an assembler-level C software simulation model as claimed in claim 1. Thus, Passerone also fails to disclose the above claimed limitation.

5.7.1.1. The Examiner respectfully replies:

5.7.1.2. Passerone was not relied upon to teach the recited limitation, so the arguments directed to the limitation do not appear to be valid.

5.8. The Applicant argues:

5.9. Passerone does not disclose annotating the simulating model with information related to estimation or determination of performance including executing delay. To the contrary, Passerone explicitly states that "[t]he execution delay of a CFSM transition is unknown a priori. It is only assumed to be non-zero . . . ." **Sec. 2, Second Bullet, Subsection 1**. Thus, Passerone not only does not disclose the above

claimed limitation but actually admits that the execution delay can only be assumed to be non-zero. Passerone thus fails, again, to disclose the aforementioned claimed limitations.

**5.9.1.1.** The Examiner respectfully replies:

**5.9.1.2.** First, following the recited statement in Passerone above, the passage continues to recite that timing information is added by the synthesis procedure.

**5.9.1.3.** Second, Passerone appears to recite , "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above" (*page 3, section 2.2, first paragraph*), which is clearly annotating a simulating model.

**5.10.** The Applicant argues:

**5.11.** Applicants respectfully submit that Zivoinovic fails to cure Passerone's deficiency as Zivojnovic is absolutely silent on annotating the simulation model.

**5.11.1.** The Examiner respectfully replies:

**5.11.2.** Zivoinovic was not relied upon to teach annotating the model.

**5.12.** The Applicant argues:

**5.13.** Moreover, not only does Zivojnovic fail to cure Passerone's deficiency, Zivoinovic actually teaches away from the claimed invention, and combining Passerone, Hellestrand, and Zivojnovic renders at least Zivojnovic unsatisfactory for its intended purpose.

5.14. Zivojnovic discloses a technique for simulating processors and attached hardware using compiled simulation. **Abstract and Sec. I, Introduction.**

5.15. On the other hand, Hellestrand explicitly discloses that "the Image\_TX module 831 is a **user program in 'C' code** running on an embedded system . ." Col. 12, U. 37-39 (emphasis added.) That is, at least the Image\_TX module is in C code in Hellestrand. Similarly, Passerone also indicates that "each S-graph node corresponds roughly to a basic block of code, that is a single-input, single-output sequence of **C code statements**." **Sec. 2.1**, right-hand column, and "[t]he formal specification . . . is . . . synthesized as **timing-annotated C code** . . ." **Sec. 2.2**, ¶1 (emphasis added). That is, part of Passerone's code is also in C code.

5.16. Nonetheless, Zivojnovic explicitly states that "[i]f the same algorithm is expressed in C, and compiled using the C compiler . . . the resulting code . . . on the simulator would last for 2 days and 3 hours. Obviously, **any experimentation with application-oriented compiler and processor adaptions is impossible.**" **Sec. II**, second full paragraph on the right-hand column (emphasis added.)

5.17. Therefore, combining Passerone, Hellestrand, and Zivoinovic renders at least Zivojnovic unsatisfactory for its intended purpose as Passerone and Hellestrand explicitly call for the use of C code which is expressly disclaimed by Zivoinovic. As such, Zivojnovic cannot be combined with Passerone and Hellestrand to preclude the patentability of the pending claims for the purpose of 35 U.S.C. § 103(a).

5.17.1. The Examiner respectfully replies:

5.17.2. First, the Applicant starts the argument with two separate assertions: 1) Zivoinovic actually teaches away from the claimed invention, and 2) combining Passerone, Hellestrand, and Zivoinovic renders at least Zivojnovic unsatisfactory for its intended purpose. However, the following

paragraphs appear to be directed only to the second assertion (i.e., *combining Passerone, Hellestrand, and Zivojinovic renders at least Zivojinovic unsatisfactory for its intended purpose*). The arguments do not appear to arrive at any conclusion that Zivojinovic actually teaches away from the claimed invention.

5.17.3. Second, in both Passerone and Hellestrand the C code appears to be compiled to instructions and then **the instructions are run on a CPU (not an instruction simulator)**, and similarly in Zivojinovic. While Zivojinovic does explicitly state that "[i]f the same algorithm is expressed in C, and compiled using the C compiler ... the resulting code . . . on the simulator would last for 2 days and 3 hours. Obviously, *any experimentation with application-oriented compiler and processor adaptions is impossible*", the instructions are being run on an instruction simulator rather than directly on a processor. The recited passage in Zivojinovic is intended to point out the problem of using an instruction simulator instead of directly executing instructions on a processor, which Zivojinovic does (*first page, section I. Introduction, right-side column, fourth paragraph that starts with, "In this paper . . .*, and *third page, section IV. Compiled Simulation of Programmable Architectures*). Thus, combining Passerone, Hellestrand, and Zivojinovic does not appear to render Zivojinovic unsatisfactory for its intended purpose.

5.18. The Applicant argues:

5.19. Claim 55 recites the following limitations:

5.20. associating performance information comprising an **predicted execution delay with an element of the assembly language** software module; and (emphasis added.)

5.21. The Office Action purports that Passerone discloses the above claimed limitations of claim 55. Applicants respectfully disagree.

5.22. To the contrary, Passerone explicitly states that "[t]he **execution delay** of a CFSM transition is **unknown a priori**. It is **only assumed to be non-zero . . .**" Sec. 2, Second Bullet, Subsection 1. Thus, Passerone not only does not disclose the above claimed limitation but actually admits that the execution delay can only be assumed to be non-zero. Passerone thus may not incorporate predicted execution delay. Therefore, Passerone fails to disclose the aforementioned claimed limitations. As such, Applicants respectfully submit that claim 55 and its respective dependent claims are believed to be allowable over the cited prior art references.

5.22.1. The Examiner respectfully replies:

5.22.2. First, Passerone is relied upon to teach, "associating performance information comprising predicted execution delay with an element of *the software module*". Hellestrand is relied upon to teach an *assembly language* software module.

5.22.3. Second, following the recited statement in Passerone above, the passage continues to recite that timing information is added by the synthesis procedure.

5.22.4. Third, Passerone appears to recite, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as **timing-annotated C code** as described above" (page 3, section 2.2, *first paragraph*). Annotating C code with timing information

appears to be associating performance information comprising a predicted execution delay.

6. Regarding claims 14 and 46 rejected under 35 USC § 103:

6.1. Applicant's arguments have been fully considered, but are not persuasive, as follows. Accordingly, the rejections are maintained.

6.2. The Applicant argues:

6.3. Applicants respectfully submit that since Passerone, Hellestrand, and Zivojnovic fail to disclose all the claimed limitations of the base claims from which claims 14 and 46 disclose, claims 14 and 46 are thus also believed to be allowable over Passerone, Hellestrand, Zivojnovic, and Hartoog, regardless whether or not Hartoog discloses the claimed limitations of claims 14 and 46. Claim 14 is nonetheless currently amended to better conform its claim language to the base claim from which claim 14 depends.

6.3.1.1. The Examiner respectfully replies:

6.3.1.2. Since the rejections of the base claims of claims 14 and 46 are maintained, the rejections of claims 14 and 46 are also maintained.

7. Regarding claims 20, 52 and 59 rejected under 35 USC § 103:

7.1. Applicant's arguments have been fully considered, but are not persuasive, as follows. Accordingly, the rejections are maintained.

7.2. The Applicant argues:

7.3. Applicants respectfully submit that since Passerone, Hellestrand, Zivojnovic fail to disclose all the claimed limitations of the base claims from which claims 14 and 46 disclose, claims 20, 52, and 59 are thus also believed to be allowable over Passerone, Hellestrand, Zivojnovic, and Suzuki, regardless whether or not Suzuki discloses the claimed limitations of claims 20, 52, and 59.

7.3.1.1. The Examiner respectfully replies:

7.3.1.2. Since the rejections of the base claims of claims 20, 52 and 59 are maintained, the rejections of claims 20, 52 and 59 are also maintained.

*Claim Objections*

8. Claim 14 is objected to for the following minor informalities: Claim 9 recites, "generating an optimized assembler code". The phrase appears to mean, "providing a software assembly code module".
9. Claim 55 is objected to for the following minor informalities: the claim recites in line 12, "the time slot". The phrase is interpreted as, "a time slot". The claim recites in line 13, "an predicted". The phrase appears to mean, "a predicted".

**10. 35 U.S.C. 101** reads as follows:

- Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

**11. Claims 33 – 34 and 36 – 40 and 41 – 54** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

**11.1.** Regarding **claims 33 – 34, 36 – 40 and 41 – 54**, the claims are directed to a computer program product that includes a medium useable by a processor, the medium comprising a sequence of instructions. However, the specification appears to allow the medium to include carrier waves (pages 29 – 30, paragraphs 138 – 139), which do not appear to be a process, machine, manufacture or composition of matter. Accordingly, the claims appear to be directed to a non-statutory category, and are rejected.

**11.2.** Regarding **claims 33 – 34, 36 – 40 and 41 – 54**, the claims are directed to a computer program product that includes a medium useable by a processor, the medium comprising a sequence of instructions. However, the specification appears to allow the medium to include transmission media such as copper wires, coaxial cable and fiber optics (pages 29 – 30, paragraphs 138 – 139). A computer program propagating in a transmission media is not a physical element. Such claimed computer programs do not define any structural and functional interrelationship between the computer program and other elements of a computer which permit the computer program's functionality to be realized. Accordingly, transmission media appear to be a non-statutory category, and the claims are rejected.

***Claim Rejections - 35 USC § 103***

- 12.** The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

- 13.** This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

- 14.** Claims 1 - 2, 4 - 13, 15 - 19, 21 - 22, 33 - 34, 36 - 45, 47 - 51, 53 - 55, 57 - 58 and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Passerone (Claudio Passerone et al.; "Fast hardware/software co-simulation for virtual prototyping and trade-off analysis", 1997, Proceedings of Design Automation Conference 1997) in view of Hellestrand (U.S. Patent Number 6,230,114), further in view of Zivojnovic (Vojin Zivojnovic, "Compiled HW/SW Co-simulation", 1996, art supplied by the Applicant on the Information Disclosure Statement dated September 10, 2001, element AP).

- 14.1.** Regarding claims 1 and 33:

14.2. Passerone appears to teach:

- 14.2.1. Describing a design for the target machine as a network of logical entities (*page 3, section 2.2, first paragraph, the sentence, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above"*);
- 14.2.2. Selecting at least one of the logical entities for a software implementation (*page 3, section 2.2, first paragraph, the sentence, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above"*);
- 14.2.3. Implementing a source software program from the logical entities selected for the software implementation (*page 3, section 2.2, first paragraph, the sentence, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above"*);
- 14.2.4. generating an optimized assembler code for the software program (*page 3, section 2.2, first paragraph, the sentence, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above"; it would have been obvious that C code is compiled in order to run a simulation, and that a compiler generates optimized assembler code*);
- 14.2.5. Generating an ~~assembler level~~ C software simulation model by translating ~~the assembler code or disassembling a binary code~~, in which the simulation model is annotated with information related to estimation or determination

of the performance comprising execution delay based upon architecture of hardware on which the software program runs (page 3, section 2.2, first paragraph, the sentence, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above");

- 14.2.6. Generating a hardware and software co-simulation model using the simulation model (page 3, section 2.2, first paragraph, the sentences, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above" and "The C code is used in Ptolemy as a model for both hardware and software components"; and page 1, right-side column, third paragraph that starts with, "It is based on . . .");
- 14.2.7. storing at least the hardware and software co-simulation model (page 3, section 2.2, first paragraph, the sentences, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above" and "The C code is used in Ptolemy as a model for both hardware and software components"; and page 1, right-side column, third paragraph that starts with, "It is based on . . ."; it would have been obvious to the ordinary artisan to save the model in order to be able to run the model multiple times).

14.3. Passerone does not specifically teach:

- 14.3.1. Performing a performance analysis using the assembler code;
- 14.3.2. Generating an assembler-level ~~software simulation model~~ by translating the assembler code or disassembling a binary code, ~~in which the simulation~~

~~model is annotated with information related to estimation or determination of the performance comprising execution delay based upon architecture of hardware on which the software program runs;~~

14.4. Hellestrand appears to teach:

14.4.1. Performing a performance analysis using the assembler code (figure 3A, elements 311, 313; and column 26, lines 6 - 18);

14.4.2. Generating a software simulation model using the assembler code (figure 3A, elements 311, 313, 315, 317, 319, 331, 333; and column 32, lines 14 - 36);

14.5. Zivojnovic appears to teach:

14.5.1. Generating an assembler-level C software simulation model by translating the assembler code or disassembling a binary code (page 692, section IV Compiled Simulation of Programmable Architectures);

14.6. The motivation to use the art of Hellestrand with the art of Passerone would have been the benefit recited in Hellestrand that there is an important advantage to the system - a linear block can be as short as a single instruction, and the user has the option of so analyzing the code to get instruction-by-instruction timing (column 25, lines 27 - 33).

14.7. The motivation to use the art of Zivojnovic with the art of Passerone would have been the benefit recited in Zivojnovic that the method offers up to three orders of magnitude faster simulation (page 690, Abstract).

14.8. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Hellestrand and Zivojnovic and Passerone to produce the claimed invention.

14.9. Regarding claims 2 and 34:

14.10. Passerone appears to teach:

14.10.1. the compiling step further comprises incorporating a description of the target machine (*page 1, right-side column, third paragraph that starts with, "It is based on using . . ."*);

14.11. Regarding claims 4 and 36:

14.12. Passerone appears to teach:

14.12.1. selecting at least one of the logical entities for a hardware implementation, and synthesizing a software model of the hardware implementation from the selected logical entities, wherein the hardware and software co-simulation model is generated using the software model of the hardware implementation (*page 3, section 2.2, first paragraph, the sentences, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above" and "The C code is used in Ptolemy as a model for both hardware and software components"; and page 1, right-side column, third paragraph that starts with, "It is based on . . ."*);

14.13. Regarding claims 5 and 37:

14.14. Passerone does not specifically teach:

14.14.1. the performance analysis measures an execution time of an element of the assembler code.

14.15. Hellestrand appears to teach:

14.15.1. the performance analysis measures an execution time of an element of the assembler code (*figure 3A, elements 311, 313; and column 26, lines 6 - 18*).

14.16. Regarding claims 6 and 38:

14.17. Passerone does not specifically teach:

14.17.1. the software program is compiled using the same compiler used to compile a production executable.

14.18. Hellestrand appears to teach:

14.18.1. the software program is compiled using the same compiler used to compile a production executable (*figure 3A, elements 331, 333*).

14.19. Regarding claims 7 and 39:

14.20. Passerone appears to teach:

14.20.1. performing the performance analysis comprises annotating the code with performance information (*page 3, section 2.2, first paragraph, the sentences, "The formal specification of the system to be modeled is first*

translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above").

14.21. Passerone does not specifically teach:

14.21.1. performing the performance analysis comprises annotating the assembler code with performance information.

14.22. Hellestrand appears to teach:

14.22.1. assembler code (figure 3A, element 311; it would have been obvious to annotate assembler code because it was old and well known to annotate code with performance information; for example, Verilog HDL includes syntax to annotate code with timing information);

14.23. Regarding claims 8 and 40:

14.24. Passerone appears to teach:

14.24.1. the performance information is timing information (page 3, section 2.2, first paragraph, the sentences, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above").

14.25. Regarding claims 9 and 41:

14.26. Passerone appears to teach:

- 14.26.1. obtaining a software assembly code module from a source code module (page 3, section 2.2, first paragraph, the sentence, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above");
- 14.26.2. translating the software code module into a simulation model (page 3, section 2.2, first paragraph, the sentences, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above" and "The C code is used in Ptolemy as a model for both hardware and software components"; and page 1, right-side column, third paragraph that starts with, "It is based on . . .");
- 14.26.3. annotating the software simulation model with performance information (page 3, section 2.2, first paragraph, the sentence, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above"; further, it was old and well known in the art to annotate code with performance information; for example, Verilog HDL includes syntax to annotate code with timing information);
- 14.26.4. storing at least the software simulation model (page 3, section 2.2, first paragraph, the sentences, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above" and "The C code is used in Ptolemy as a model for both hardware and software components"; and page 1, right-side column, third paragraph that starts with, "It is based on . . ."; it would have been obvious to the ordinary).

artisan to save the model in order to be able to run the model multiple times);

14.27. Passerone does not specifically teach (the missing parts are indicated in **bold, italic, underline**):

14.27.1. obtaining a software assembly code module from a source code module;

14.27.2. translating the assembly code module into a software simulation model;

14.27.3. wherein the software simulation model is an assembler-level software simulation model, expressed in a high-level programming language.

14.28. Hellestrand appears to teach:

14.28.1. obtaining a software assembly code module from a source code module (figure 3A, elements 319, 331, 333);

14.29. Zivojnovic appears to teach:

14.29.1. translating the assembly code module into a software simulation model (page 692, section IV Compiled Simulation of Programmable Architectures; and page 693, figure 1 b));

14.29.2. wherein the software simulation model is an assembler-level software simulation model, expressed in a high-level programming language (page 692, section IV Compiled Simulation of Programmable Architectures; and page 693, figure 1 b)).

14.30. Regarding claims 10 and 42:

14.31. Passerone does not specifically teach:

14.31.1. providing a software assembly code module comprises compiling software source code to assembly.

14.32. Hellestrand appears to teach:

14.32.1. providing a software assembly code module comprises compiling software source code to assembly (*figure 3A, elements 309, 311*).

14.33. Regarding claims 11 and 43:

14.34. Passerone appears to teach:

14.34.1. the software code module is compiled using a compiler adapted to create code that will execute on a first machine architecture (*page 3, section 2.2, first paragraph, the sentence, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above"; it would have been obvious that the C code was compiled*);

14.35. Passerone does not specifically teach:

14.35.1. assembly code

14.36. Hellestrand appears to teach:

14.36.1. assembly code (*figure 3A, element 311*).

14.37. Regarding claims 12 and 44:

14.38. Passerone appears to teach:

14.38.1. the performance information is associated with the first machine architecture (*page 3, section 2.2, first paragraph, the sentence, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above"*);

14.39. Regarding claims 13 and 45:

14.40. Passerone appears to teach:

14.40.1. the simulation model is compiled to execute on a second machine architecture, the second machine architecture being different from the first machine architecture (*page 3, section 2.2, first paragraph, the sentence, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above"*);

14.41. Regarding claims 15 and 47:

14.42. Passerone does not specifically teach:

**14.42.1.** the high-level programming language comprises a C code programming language;

**14.43.** Zivojnovic appears to teach:

**14.43.1.** the high-level programming language comprises a C code programming language (*page 693, figure 1, section b*);

**14.44.** Regarding claims 16 and 48:

**14.45.** Passerone appears to teach:

**14.45.1.** the translation step further comprises gathering information from the source code module from which the assembly code module was obtained (*page 3, section 2.2, first paragraph, the sentence, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above"; it would have been obvious that in order to annotate code with timing information that source code module provided information*);

**14.46.** Regarding claims 17 and 49:

**14.47.** Passerone does not appear to teach:

**14.47.1.** information gathered comprises high-level hints about the software assembly code module.

**14.48.** Hellestrand appears to teach:

**14.48.1.** information gathered comprises high-level hints about the software assembly code module (*figure 3A, elements 313, 315*).

**14.49.** Regarding claims 18 and 50:

**14.50.** Passerone does not appear to teach:

**14.50.1.** the performance information comprises estimated performance information.

**14.51.** Hellestrand appears to teach:

**14.51.1.** the performance information comprises estimated performance information (*figure 3A, elements 313, 315*).

**14.52.** Regarding claims 19 and 51:

**14.53.** Passerone does not appear to teach:

**14.53.1.** the performance information is statically estimated.

**14.54.** Hellestrand appears to teach:

**14.54.1.** the performance information is statically estimated (*figure 3A, elements 313, 315*).

**14.55.** Regarding claims 21 and 53:

14.56. Passerone appears to teach:

14.56.1. compiling the simulation model to a simulator host program (page 3, section 2.2, first paragraph, the sentences, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above"; and page 1, right-side column, third paragraph that starts with, "It is based on . . .");

14.56.2. executing the simulator host program on a simulator to allow performance measurements to be taken (page 3, section 2.2, first paragraph, the sentences, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above"; and page 1, right-side column, third paragraph that starts with, "It is based on . . .");

14.57. Regarding claims 22 and 54:

14.58. Passerone appears to teach:

14.58.1. linking an already annotated module with the simulation model (page 3, section 2.2, first paragraph, the sentences, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above"; and page 1, right-side column, third paragraph that starts with, "It is based on . . .");

14.59. Regarding claim 55:

14.60. Passerone appears to teach:

14.60.1. associating performance information comprising an predicted execution delay with an element of the software module (*page 3, section 2.2, first paragraph, the sentence, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above"*);

14.60.2. ~~processing the data structure to refine the accuracy of an assembler-level software simulation model by generating the assembler level software simulation model using the assembly language software module, wherein the assembler level software simulation model is expressed in a high-level programming language and is used to determine the time slot~~ (*page 3, section 2.2, first paragraph, the sentence, "The formal specification of the system to be modeled is first translated by POLIS into a network of CFSMs, and then synthesized as timing-annotated C code as described above"*);

14.61. Passerone does not specifically teach (the missing parts are indicated in **bold**, italic, underline):

14.61.1. receiving the assembly language software module;

14.61.2. parsing the assembly language software module into a data structure, the data structure comprising one or more nodes, each of the one or more nodes being mapped to a period of time using a mapping definition,

each of the one or more nodes containing an element of the assembly language software module;

14.61.3. processing the data structure to refine the accuracy of an assembler-level software simulation model by generating the assembler-level software simulation model using the assembly language software module, wherein the assembler-level software simulation model is expressed in a high-level programming language and is used to determine the time slot;

14.61.4. associating performance information comprising an predicted execution delay with an element of the assembly language software module;

14.61.5. displaying a result of the simulation model or storing the simulation model in a tangible computer readable media;

14.62. Hellestrand appears to teach:

14.62.1. receiving the assembly language software module (figure 3A, element 311);

14.62.2. parsing the assembly language software module into a data structure, the data structure comprising one or more nodes, each of the one or more nodes being mapped to a period of time using a mapping definition, each of the one or more nodes containing an element of the assembly language software module (figure 3A, elements 313, 315);

14.62.3. processing the data structure to refine the accuracy of the simulation model (figure 3A, elements 313, 315);

14.62.4. associating performance information comprising an predicted execution delay with an element of the assembly language software module (*figure 3A, elements 311, 313; and column 26, lines 6 - 18*);

14.62.5. displaying a result of the simulation model or storing the simulation model in a tangible computer readable media (*figure 3A, elements 331, 333*);

14.63. Zivojnovic appears to teach:

14.63.1. generating an assembler-level software simulation model using the assembly language software module, wherein the assembler-level software simulation model is expressed in a high-level programming language (*page 692, section IV Compiled Simulation of Programmable Architectures*);

14.64. Regarding claim 57:

14.65. Passerone does not specifically to teach:

14.65.1. the performance information comprises an execution delay value for the element of the assembly language software module.

14.66. Hellestrand appears to teach:

14.66.1. the performance information comprises an execution delay value for the element of the assembly language software module (*figure 3A, elements 311, 313, 315, 317, 303, 319*).

**14.67.** Regarding claim 58:

**14.68.** Passerone does not specifically teach:

**14.68.1.** the performance information is a statically computed value.

**14.69.** Hellestrand appears to teach:

**14.69.1.** the performance information is a statically computed value (figure 3A, elements 311, 313, 315, 317, 303, 319).

**14.70.** Regarding claim 60:

**14.71.** Passerone does not specifically teach:

**14.71.1.** processing the data structure comprises replicating the behavior of the assembly language software model in the simulation model.

**14.72.** Hellestrand appears to teach:

**14.72.1.** processing the data structure comprises replicating the behavior of the assembly language software model in the simulation model (figure 3A, elements 311, 313, 315, 317, 303, 319).

**15. Claims 14 and 46** are rejected under 35 U.S.C. 103(a) as being unpatentable over Passerone as modified by Hellestrand and Zivojnovic as applied to claims **1 - 2, 4 - 13, 15 - 19, 21 - 22, 33 - 34, 36 - 45, 47 - 51, 53 - 55, 57 - 58 and 60** above, further in

view of Hartoog (Hartoog, Mark R.; Rowson, James A.; Reddy, Prakash D.; Desai, Soumya; Dunlop, Douglas D.; Harcourt, Edwin A.; Khullar, Neeti; "Generation of Software Tools from Processor Descriptions for Hardware/Software Codesign", Proceedings of the 34<sup>th</sup> Design Automation Conference, June 9 - 13 1997).

15.1. Passerone as modified by Hellestrand and Zivojnovic teaches a method for preparing software for a performance estimation as applied to claims 1 - 2, 4 - 13, 15 - 19, 21 - 22, 33 - 34, 36 - 45, 47 - 51, 53 - 55, 57 - 58 and 60 above.

15.2. Regarding claims 14 and 46:

15.3. Passerone as modified by Hellestrand and Zivojnovic does not specifically teach:

15.3.1. disassembling software binary code to assembly code.

15.4. Hartoog appears to teach:

15.4.1. disassembling software binary code to assembly code (page 305, section 5).

15.5. The motivation to use the art of Hartoog with the art of Passerone as modified by Hellestrand and Zivojnovic would have been the benefit recited in Hartoog that, using a declarative description of an instruction set makes it possible to automatically generate several useful tools such as an Instruction Set Simulator and a Compiled Instruction Set Simulator (page 304, section 3. Tools, first paragraph), which would have been recognized as important benefit to save time by the ordinary artisan.

15.6. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Hartoog with the art of

Passerone as modified by Hellestrand and Zivojnovic to produce the claimed invention.

**16. Claims 20, 52 and 59** are rejected under 35 U.S.C. 103(a) as being unpatentable over Passerone as modified by Hellestrand and Zivojnovic as applied to claims **1 - 2, 4 - 13, 15 - 19, 21 - 22, 33 - 34, 36 - 45, 47 - 51, 53 - 55, 57 - 58 and 60** above, further in view of Suzuki (Suzuki, Kei; Sangiovanni-Vincentelli, Alberto; "Efficient Software Performance Estimation Methods for Hardware/Software Codesign", 1996, Proceedings of the 33<sup>rd</sup> annual conference on Design Automation).

**16.1.** Passerone as modified by Hellestrand and Zivojnovic teaches a method for preparing software for a performance estimation as applied to claims **1 - 2, 4 - 13, 15 - 19, 21 - 22, 33 - 34, 36 - 45, 47 - 51, 53 - 55, 57 - 58 and 60** above.

**16.2.** Regarding claims **20 and 52**:

**16.3.** Passerone as modified by Hellestrand and Zivojnovic does not specifically teach:

**16.3.1.** performance information is computed dynamically at run-time, using a formula provided during the annotating step.

**16.4.** Suzuki appears to teach:

**16.4.1.** performance information is computed dynamically at run-time, using a formula provided during the annotating step (page 5, figure 4, run-time formula to calculate C<sub>i</sub>.max time).

16.4.1.1. Regarding (page 5, figure 4, run-time calculation of  $C_i.max\_time$ ); it would have been obvious to use the dynamic run-time formula as the annotation.

16.5. Regarding claim 59:

16.6. Passerone as modified by Hellestrand and Zivojnovic does not specifically teach:

16.6.1. performance information is a formula for dynamically computing a value.

16.7. Suzuki appears to teach:

16.7.1. performance information is a formula for dynamically computing a value (page 5, figure 4, run-time formula to calculate  $C_i.max\_time$ ).

16.8. The motivation to use the art of Suzuki with the art of Passerone as modified by Hellestrand and Zivojnovic would have been the benefit recited in Suzuki that, two methods are presented for accurate and fast estimation of software performance in embedded real-time reactive systems designed with the POLIS system (page 1, section 1. Introduction, second paragraph that starts with, "In this paper, we..."), which would have been recognized as important benefit to save time by the ordinary artisan.

16.9. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Suzuki with the art of Passerone as modified by Hellestrand and Zivojnovic to produce the claimed invention.

17. **Examiner's Note:** Examiner has cited particular columns and line numbers in the references applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings of the art and are

applied to specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the Applicant in preparing responses, to fully consider the references in their entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner. The entire reference is considered to provide disclosure relating to the claimed invention.

*Conclusion*

18. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).
19. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.
20. The prior art made of record but not relied upon is pertinent to the Applicant's disclosure:
  - 20.1. Bradford (U.S. Patent 5,857,093) teaches a method of performance simulation for a processor which is fast and has accurate timing information: compiling source code for a target processor to assembly code, extracting timing information from the assembly code, annotating the source code with the timing

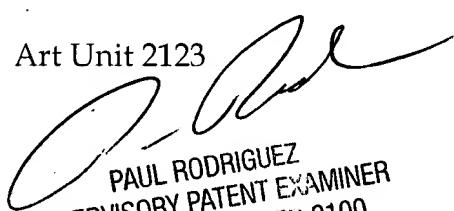
information, compiling the source code for a simulation processor, running the compiled code on the simulation processor.

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Russ Guill whose telephone number is 571-272-7955. The examiner can normally be reached on Monday - Friday 10:00 AM - 6:30 PM.
22. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached on 571-272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Any inquiry of a general nature or relating to the status of this application should be directed to the TC2100 Group Receptionist: 571-272-2100.
23. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Russ Guill

Examiner

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